## ABSTRACT OF THE DISCLOSURE

A multi-channel spectrometer and a light source are used to measure both the emitted and the reflected light from a surface which is at an elevated temperature relative to its environment. The geometry of the emitted light measurement should be effectively identical to the geometry of the reflected light measurement. The emissivity of the surface in each spectrometer channel may be computed using either of two methods. In a first method, the spectrum of the incident light may be measured by the spectrometer. The temperature of the surface and emissivity in each wavelength may be calculated from a knowledge of the spectrum and the measurement of the incident and reflected light. In the second method, the reflected light may be measured from a reference surface having a known reflectivity and the same geometry as the surface of interest. The emitted and the reflected light may then be measured for the surface of interest. These measurements permit the computation of the emissivity in each channel of the spectrometer and the temperature of the surface of interest. One example of application of the method to a small and uniform spatial area at one point in time is given by describing an experiment in which a flat plate is shocked. The method can be easily adapted to produce a record of temporal and spatial variations in temperature using an array of sensors, such as can be provided by digital video cameras and a pulsed light source.